REMARKS

Entry of this amendment in this application, and reconsideration of this application based on that amendment and the following remarks, are respectfully requested.

Claims 1 through 5, 7 through 10, and 13 remain in this case. Amendment to claim 8 is presented in this paper.

Claim 8 is amended to correct a punctuation error of a typographical nature. Entry of the amendment to claim 8 is respectfully requested.

Claims 1 through 4, 7, 8, and 13 were finally rejected under §103 as unpatentable over the Nozaki et al. reference.[1] Claims 5, 7, 9, and 10 were finally rejected under §103 as unpatentable over the Nozaki et al. reference in view of the Tseng reference.[2]

Applicant traverses the final rejection of the claims.

The Examiner asserted, relative to claim 1, that the Nozaki et al. reference teaches all of the elements of claim 1, except for the nitrogen containing gas also including oxygen, and for the plasma striking step also causing thermal oxidation of a portion of the underlying silicon containing structure. The Examiner asserted, however, that it would have been obvious for one skilled in the art to incorporate oxygen into the gas, "since the thermally nitrided portion of the silicon containing structure also contained oxygen", thus making it obvious that the silicon that was thermally nitrided would also have been thermally oxidized. The additional elements of dependent claims 2 through 4 were found by the Examiner in the Nozaki et al. reference, and the additional recitation of claim 5 was found by the Examiner in the Tseng reference, and found to be obviously combinable with the teachings of the Nozaki et al. reference so as to reach claim 5.

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[1] U.S. Patent No. 4,298,629 to Nozaki et al.
[2] U.S. Patent No. 5,643,819 to Tseng.

Applicant respectfully traverses the final rejection of claim 1 and its dependent claims, on the grounds that the teachings of the prior art fall short of the requirements of claim 1, and that there is no suggestion from the prior art to modify these teachings so as to reach the claim.

As previously argued, claim 1 requires the providing of a gas comprising a mixture of nitrogen and oxygen to a silicon-containing structure, elevating the temperature of the structure, and striking a plasma above the structure to cause thermal nitridation and oxidation of a portion of the silicon-containing structure. Also as previously argued, the method of amended claim 1 provides the important advantage of forming high quality silicon nitride films that are suitable for use in high performance integrated circuits such as DRAMs and high performance logic devices, without involving the significant expense, contamination risk, and trapped charge effects of conventional nitride forming methods.

Applicant first respectfully traverses the rejection on the grounds that, contrary to the assertion by the Examiner, the Nozaki et al. reference fails to disclose the presence of "oxygen" in the portion of the silicon containing structure that is thermally nitrided. Attention to the cited locations of the Nozaki et al. reference provides only a single reference to oxygen or an oxide. This reference to oxide[3] is only a point of comparison to the much reduced etch rate of the silicon nitride formed according to the Nozaki et al. teachings, and nowhere indicates that a silicon dioxide is at all formed according to the reference. To the extent that the reference elsewhere mentions the presence of oxygen, oxygen is described as an undesired contaminant ("foreign matter") that is adsorbed at the surface of the nitride film.[4] Oxygen is therefore clearly not intentionally present in the dielectric film of the reference. Therefore, Applicant respectfully traverses the §103 of claim 1 and its dependent claims, on the grounds that the Examiner has misinterpreted the teachings of the reference in discovering the presence of oxygen and oxide in the disclosed structure.

Furthermore, Applicant again respectfully submits that there is no suggestion from the prior art to modify the teachings of the Nozaki et al. reference in such a manner as to reach

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[3] Nozaki et al., *supra*, column 5, lines 54 through 56.
[4] Nozaki et al., *supra*, column 6, lines 20 through 22.

claim 1. Indeed, Applicant submits that the Nozaki et al. reference teaches away from such a modification.

The Nozaki et al. reference, as noted above, teaches only the use of gas sources of nitrogen;[5] none of these specified gases includes any oxygen. The reference expressly states that the reason for the selection of these gases is to avoid oxygen concentration in the resulting structure.[6] In light of these express teachings of the Nozaki et al. reference, Applicant submits not only that there is no suggestion to modify the teachings of the reference to include oxygen in the gas used to form a dielectric, but also that the skilled artisan is directed by the reference to not include oxygen in its gas for forming the dielectric layer. The Tseng reference, cited against claim 5, certainly provides no teachings in this regard, much less sufficient to motivate one beyond the express discouragement to use oxygen provided by the Nozaki et al. reference.

Accordingly, Applicant respectfully submits that claim 1 and its dependent claims are patentably distinct over the prior art of record, because there is no suggestion from the prior art to modify the teachings of the Nozaki et al. reference in such a manner as to reach the claim.

Reconsideration of the §103 rejection of claims 1 through 5 is therefore requested.

Claim 7, and its dependent claim 8, was finally rejected under §103 as unpatentable over the Nozaki et al. reference, on similar grounds as stated relative to claim 1, and based on the further assertion that a gate structure overlying the dielectric layer of the Nozaki et al. reference would have been provided. Dependent claims 9 and 10 were rejected under §103 as unpatentable over the Nozaki et al. reference in view of the Tseng reference.

As previously urged, claim 7 requires the providing of a gas comprising a mixture of nitrogen and oxygen over a bottom structure, heating this structure to a temperature at least 900C, and creating a plasma over the structure to cause its thermal nitridation and thermal oxidation, and form a dielectric over the structure. This method provides the important benefits noted above relative to claim 1.

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[5] Nozaki et al., *supra*, at column 3, lines 22 through 29; at column 4, lines 33 through 36.
[6] Nozaki et al., *supra*, at column 3, lines 3 through 6.

Applicant also traverses the rejection of claim 7 and its dependent claims, for the same reasons as discussed above relative to claim 1. In brief, Applicant submits that the Nozaki et al. does not disclose the presence of oxygen in the dielectric nitride film formed according to its teachings, except as a contaminant or as a point of reference in comparing the nitride etch rate. Further, given the express teachings of the Nozaki et al. reference that oxygen is undesired in the formation of nitride and should be avoided, Applicant submits that there is no suggestion from the prior art, including the Tseng reference, to modify the teachings of the Nozaki et al. reference to include oxygen in the gas provided over the bottom structure, as required by claim 7 and its dependent claims.

For these reasons, Applicant respectfully traverses the §103 rejection of claim 7 and its dependent claims, and requests reconsideration of their final rejection.

Claim 13 was finally rejected under §103 as unpatentable over the Nozaki et al. reference, on the same grounds as claims 7 and 8.

As previously argued, claim 13 is directed to a method of forming a gate dielectric layer that requires the providing of a gas comprised of a mixture of nitrogen and oxygen, heating a substrate to an elevated temperature greater than 900C, and subjecting the substrate to a plasma, where the combination of the gas, temperature, and plasma cause thermal nitridation and oxidation of a portion of the substrate. The claimed method then further requires the forming of a gate electrode over the nitrided and oxidized portion of the substrate. This method provides important advantages in the fabrication of integrated circuits, as discussed above relative to claims 1 and 7.

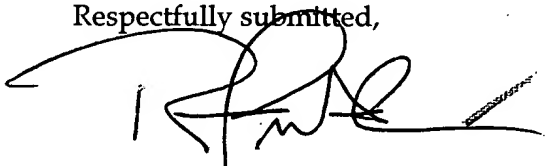
For the same reasons as discussed above relative to claims 1 and 7, Applicant respectfully traverses the rejection of claim 13. Nowhere does the Nozaki et al. reference disclose the providing of an oxygen gas, nor does it disclose the presence of oxygen in its process except as a contaminant (or as a point of reference for etch comparison). Further, given the assertions in the reference that oxygen is to be avoided in the formation of a nitride

according to the Nozaki et al. teachings, Applicant respectfully submits that there is no suggestion from the prior art to modify its teachings in such a manner as to reach claim 13.

Applicant therefore respectfully submits that claim 13 is patentably distinct over the prior art of record in this case, and traverses the final rejection accordingly.

Applicant respectfully submits that entry of the above amendment places all claims in this case in condition for allowance. Entry of the above amendment in, and reconsideration of, the subject application are therefore respectfully requested.

Respectfully submitted,



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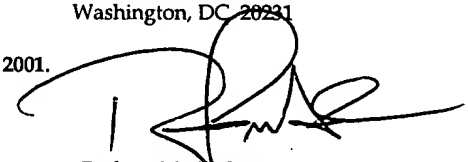

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